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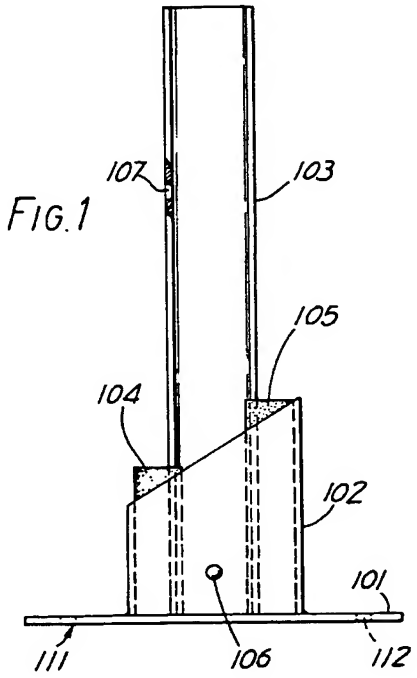
(54) Post assemblies, particularly for vehicle barriers.

(57) A post assembly, particularly for forming a vehicle barrier, comprises a vertical I-section steel beam (103) seated in an upwardly-open tubular socket (102) welded to a flat metal base plate (101). To enable impact-absorbing deflection of the upright beam (103), and thereby reduce damage to vehicles and stress on the base plate (101) when impacts occur, rubber blocks (104,105) are disposed between the foot of the beam (103) and the walls of the socket (102) to serve as buffers allowing a limited degree of deflection.

FIG.1



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This invention relates to post assemblies, and in particular assemblies having posts which are designed to withstand vehicle impacts. In particular, the invention is concerned with the way in which a post is held in position and reacts to impacts.

The use of posts to form vehicle barriers is widespread, commonly with plural posts supporting and connected by a longitudinal strip barrier. Posts also have other uses in which they may be subject to vehicle impacts or similar heavy impacts, for example, supporting traffic signs.

Conventionally, an upright post is either set in concrete or bolted down to the ground by a welded-on base plate. Such posts can be made sufficiently strong to withstand heavy impacts e.g. direct vehicle impacts at up to moderate speeds.

We note however that the properties of these posts may be poorly adjusted to their circumstances. Where vehicle speed is predominantly low e.g. in car parks, on industrial premises or in town centres, the majority of vehicle (and other) impacts against a post will be minor. Only occasionally is the full impact resistance of the post tested. However, the properties of high strength and possibility of rigidity - necessary for securing against the occasional heavy impact - result in relatively serious denting of vehicles when the minor impacts occur.

We have also noted that, where such posts are bolted-down, successive minor impacts rapidly loosen the bolts leading to a heavy maintenance burden.

With minor impacts in mind, flexible barrier posts have been proposed made of relatively thin springy steel strip, of which one portion is bolted down while a free arm is left upstanding e.g. for the attachment of a longitudinal barrier strip such as the "Armco" type. Unfortunately these flexible barriers cannot withstand severe impacts and cannot therefore be used where high security is needed.

The aim of this invention, having the above problems in mind, is to provide a novel post assembly.

In the invention we provide a post assembly and particularly an impact-absorbing barrier post assembly, which has a rigid post installed with its root received in a rigid socket. A deformable material is disposed in the socket between the rigid post and the rigid socket wall so that the post can be deflected relative to the socket, with deformation of the deformable material, in an impact-absorbing manner.

The deformable material is preferably a resilient material, and most preferably an elastomeric material such as rubber, so that it can absorb repeated impacts against the rigid post and return to the original position.

The socket desirably functions as a substantially rigid limit on the deflection of the post, such that after a certain degree of deformation of the deformable material the resistance becomes substantially rigid.

Thus, the energy of minor impacts may be absorbed in the deformable member. Where vehicle impacts are concerned, damage to vehicles can thereby be significantly reduced. Since the post itself is desirably essentially rigid e.g. a box, tube or I-section metal column, it has the capacity to take a heavy impact e.g. by abutment against one or more essentially rigid deflection-limiting portions of the socket itself, or some other adjacent deflection-limiting abutment, after a certain amount of deflection.

The assembly may be a "retro-fittable" assembly, with the socket having means for securing it on or in some permanent surface such as a floor or wall. For example, a base plate attachable to a surface, e.g. by bolting, may be provided on the socket which may be in the form of a tube or part-tube projecting from the base plate. Projection above the base plate is preferred, avoiding the need to bore any post-hole in the permanent surface.

We note that, because the deflectable post generates lesser forces for the majority of impacts, the demands on securements such as bolt-down plates are less severe and the maintenance burden can be reduced correspondingly.

The invention may also be embodied by forming the socket directly as a post-hole in an existing or purpose-made wall or floor. For example, flooring panels, e.g. for a car park, may be formed with recessed post-holes in which the rigid posts and deformable elements are fitted directly. A floor panel having such post installations is an aspect of the invention.

The invention may be embodied by isolated posts which may be barrier posts and/or support posts e.g. for signs. In another common embodiment, however, a barrier comprises plural posts supporting an elongate barrier element e.g. a barrier strip such as the well-known "Armco" type, extending between adjacent posts.

Preferably the deformable material is substantially contained within the socket. It may be in the form of one or more blocks adjacent or sandwiching the socketed end of the rigid post. Or, it may be in annular form extending right around the rigid post. In many applications impacts are anticipated from only one general primary direction, so the deflection characteristics need not be uniform in all directions. In particular, the deformable material may be located selectively at positions where compression will occur for the general primary deflections. For example, material may be opposed in

front of and behind the rigid post. It may be provided behind the post and above, and/or in front of the post and below, a pivot location for the typical deflection.

The rigid post may be retained and aligned in the socket substantially by its engagement with the deformable material e.g. by an interference fit of resilient material between the post end and socket wall. Alternatively or additionally, means such as bolts or retaining projections may be provided to prevent the post from escape from the socket.

Such means may also provide a pivot point for deflection.

Typically, the assembly will project between 0.4 and 2.5m from the surface e.g. wall or floor.

The purpose of the deformable material is to increase the distance of movement and hence reduce the force with which the post absorbs impact energy. For that purpose, it is preferred that an impact-exposed portion of the post - typically the top of the post - can be deflected at least 20mm, preferably at least 50mm and perhaps as much as 100mm or even 200mm or more (particularly for longer posts) by deformation of the deformable material alone, without permanently deforming the rigid components.

In the preferred application of the post as a vehicle barrier, the post needs to be able to absorb the energy of at least a typical low-speed impact in the course of this deflection. Generally, the assembly components are chosen and constructed such that impact energy of at least 5kNm can be taken up by deformation - preferably resilient deformation - of the deformable material only. Furthermore, the assembly as a whole - with or without permanent deformation - is preferably able to withstand at least a 15kNm lateral impact to give effective security where needed. Given the underlying concept, the achieving of such parameters is straightforward for the skilled person using readily-available materials. They are mentioned here to illustrate the properties generally required for vehicle impact resistance.

Embodiments of the invention are now described by way of example, with reference to the accompanying drawings in which:

Fig. 1 is a side elevation of a surface-mountable barrier post embodying the invention;

Figure 2 is a top view of the barrier post of Fig. 1;

Figure 3 is a schematic vertical section through a second embodiment;

Figure 4 is a horizontal section at IV-IV of Fig. 3;

Figure 5 is a corresponding cross-section in a different construction;

Figure 6 is a horizontal cross-section through a rubber mounting element, and

Fig. 7 shows another proposal for preventing removal of a post from its socket.

With reference to Figs. 1 and 2, an upright vehicle barrier post comprises a flat base plate 101, a socket 102 integral with and extending and opening upwardly from the base plate 101, and an I-section beam 103 with its lower end in the socket 102. Front and rear rubber blocks 104,105, received mostly or entirely within the socket 102, support the beam 103 vertically by gripping its front and rear flanges with an interference fit.

In this embodiment the socket 102 is a rectangular steel tube, welded to the upper surface of the rectangular steel base plate 101. The base plate has two front bolt holes 111 and a rear bolt hole 112. Since the front bolts take the major pull when the post is hit from the front (the design direction), they are double and arranged well-spaced from the beam axis. The beam 103 is supported against impact primarily by the rear wall of the socket 102, which extends e.g. between 25% and 50% of the beam length. In the embodiment the socket rear wall is about 200mm high and the beam 103 from 500mm to 800mm high. To save material, in the confidence that impacts will come only from one direction, the front socket wall and rubber block 104 are made lower - about half the height.

The rubber blocks or resilient buffers 104,105 are separate, leaving central clearance for a transverse securing bolt 106 through socket and beam. The interference grip of the rubber on the beam may be a tonne or more, however, so the bole may not be necessary. Effectively, the buffer blocks 104,105 hold the beam 103 in place and in its vertical alignment. The back-to-front thickness of the rear block 105 is about 30mm in this embodiment; typically it might vary from 10 to 100mm depending on the overall size and required performance of the assembly.

Suitable material for the buffer blocks 104,105 is a routine choice for the skilled person, taking into account the required performance. Natural rubber or EPDM may be used, for example. Since weather resistance is usually desirable, EPDM is preferred.

An attachment point for a longitudinal barrier strip, such as an "Armco" strip, is provided on the front of the beam 103. In this embodiment, it involves simply a bolt hole 107 through the front flange of the beam 103, about two-thirds of the way up.

In tests, we found that an assembly constructed as described and used in a vehicle barrier was able to withstand the impact of a 1.5t vehicle travelling at 4.5ms^{-1} without difficulty, and the damage done to the test vehicle was much less than with a traditional rigid post.

Furthermore, the strain on the fixing bolts was greatly reduced by comparison with the traditional

rigidly-mounted rigid post withstanding the same impact. The traditional post needed 25mm bolts to avoid pull-out. This embodiment avoided pull-out with only 16mm bolts, and even smaller bolts may be usable. The difference in ease of installation, in terms of time, manpower and tools, between 16mm and 25mm bolts is very great and represents a significant advantage of this design.

Referring next to Fig. 3, a column 10 of steel I-section (to BS4) is mounted in a circular hole 12 formed in a concrete floor panel 14. The column 10 is supported by resilient members 16 manufactured of natural rubber or EPDM and interposed between the column 10 and the side walls 18 of the recess 12.

Fig. 4 shows in more detail the cross-section of the resilient members 16. It can be seen that in this embodiment they have a rectangular recess 20 which complements the flange of the steel column 10, and a number of flow recesses 22 disposed between abutment ribs 24 into which rubber may flow from abutment portions 24 when the column 10 is deflected so as to put that resilient member into compression.

Fig. 5 shows an alternative arrangement in which only one resilient member 16 is provided. Provided a suitable pivoting can be assured, it may not matter on which side of the column 10 the resilient member is provided.

Fig. 6 shows a feature which may be used on the resilient members, namely tolerance ribs 32. These tolerance ribs 32 are substantially triangular in cross-section, and extend from the abutment ribs 24. When the resilient member 16 is fitted in the recess 12 with the column 10, the tolerance ribs 32 deform to take up minor dimensional errors. Thus, the precise matching of the recess size to the rubber becomes less critical.

Fig. 7 shows alternative means for preventing uprooting of the column 10 e.g. by vandals. A flange 34 is provided on the column 10 slightly above the surface of the floor 14. The flange 34 may be e.g. welded on.

After seating of the column 10 in its recess, a retaining member 36 is fixed to the floor 14 by bolts 38. The retaining member has a second flange 40 which extends over the flange 34. The clearances between the flange 34 and the floor 14 and between the flange 34 and second flange 40 are sufficient to allow deflection of the column 10 in response to minor impacts.

Thus, the column 10 is prevented from being removed without difficulty.

Having erected a column 10 as described above, it can then be used to support e.g. a horizontal barrier 42, such as of the "Armco" type, or a road sign, and/or the column may be painted to act as a visible marker.

Claims

1. An impact-resistant post assembly comprising a rigid post having an end received in a socket having a rigid wall, and characterised by deformable material in the socket between the rigid post and the rigid wall of the socket, to enable impact-absorbing deflection of the rigid post relative to the socket.

2. A post assembly according to claim 1 in which the deformable material is resilient.

3. A post assembly according to claim 2 in which the deformable material is elastomeric.

4. A post assembly according to any one of the preceding claims in which the socket is fast with a fixing member for securing the post assembly onto a permanent surface.

5. A post assembly according to claim 4 in which the fixing member comprises a plate and the socket comprises walls projecting from the plate.

6. A post assembly according to any one of the preceding claims in which the socket is recessed in a floor or wall.

7. A post assembly according to any one of the preceding claims in which the rigid post is held between opposed individual portions of said deformable material which are aligned with a primary deflection direction of the rigid post.

8. A post assembly according to any one of the preceding claims, between 0.4 and 2.5m in projecting length.

9. A post assembly according to claim 2 or any claim dependent thereon in which resilient deformation of the deformable material permits deflection of an impact-exposed portion of the rigid post through at least 20mm, preferably at least 50mm.

10. A post assembly according to claim 2 or any claim dependent thereon, capable of absorbing at least 5kNm of impact energy against the rigid post by resilient deformation of the deformable material.

11. A barrier comprising plural post assemblies according to any one of claims 1 to 10 arranged spaced from one another, and an elongate barrier element fixed to and extending between the rigid posts thereof.

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FIG.1

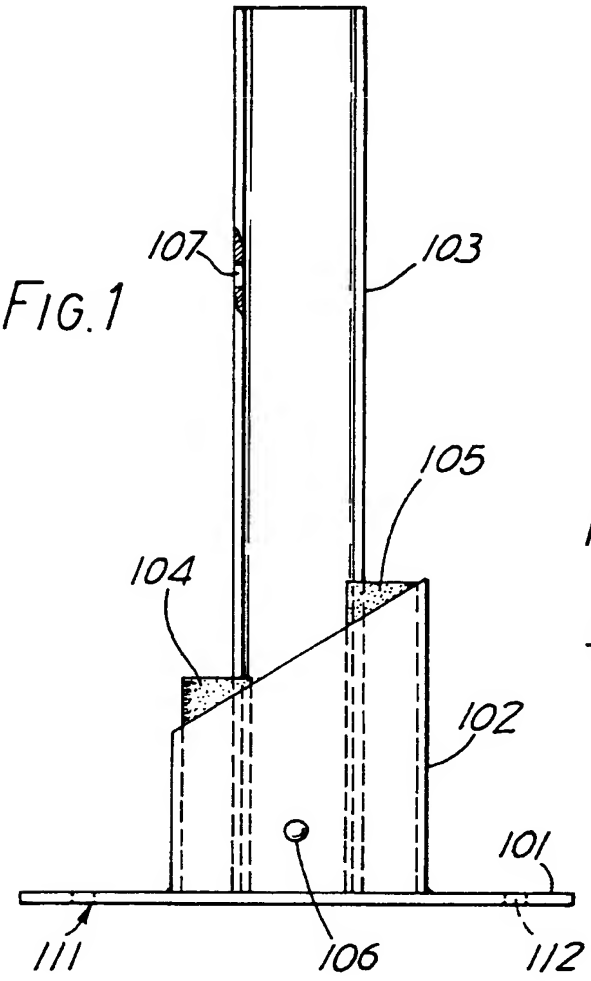
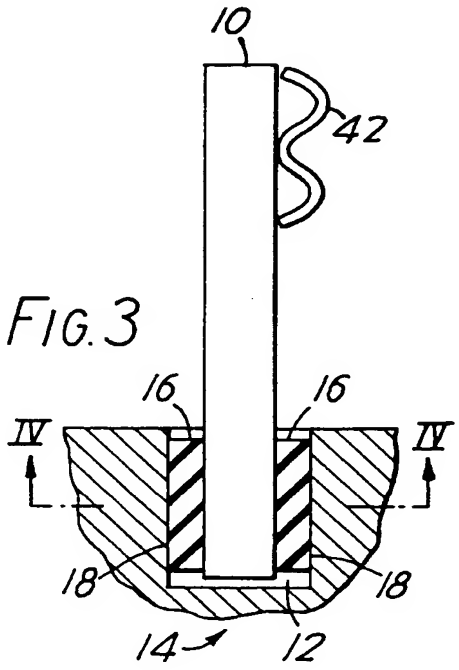


FIG.3



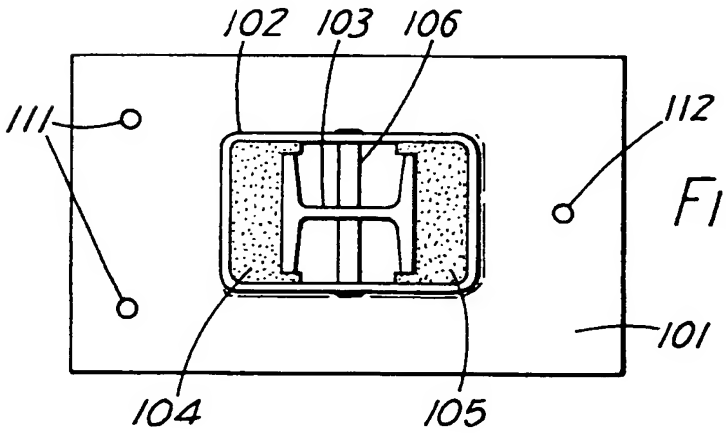


FIG.2

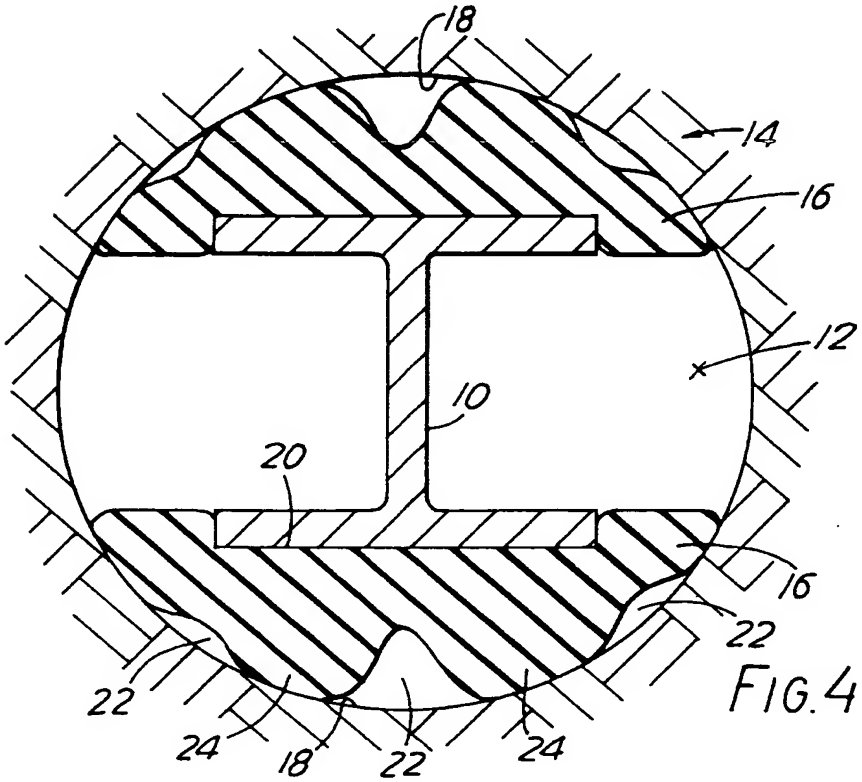


FIG.4

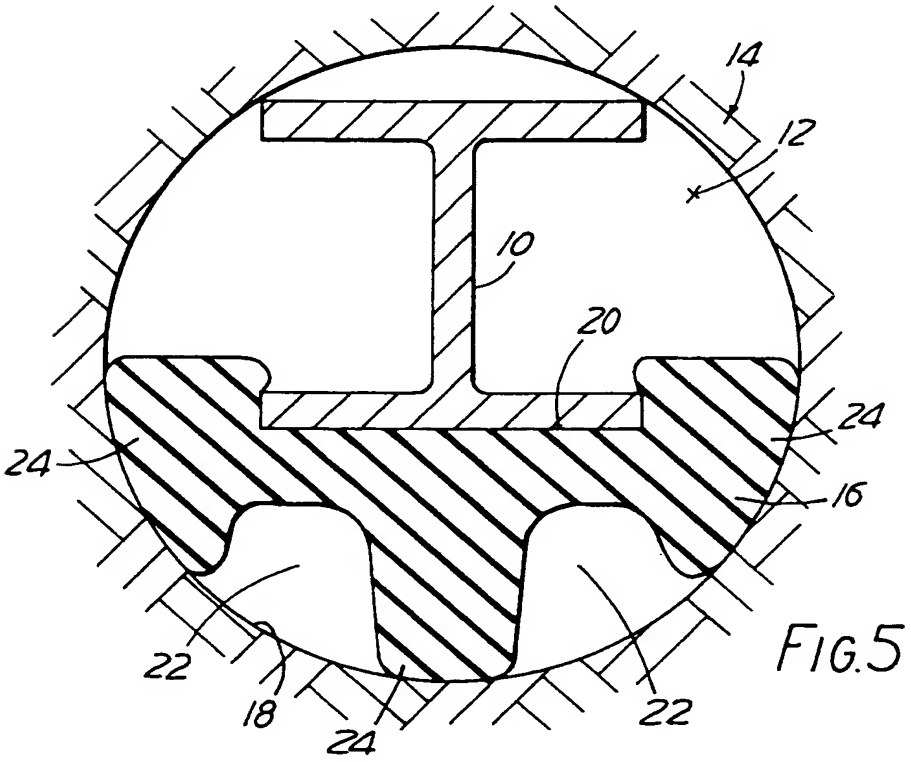


FIG.5

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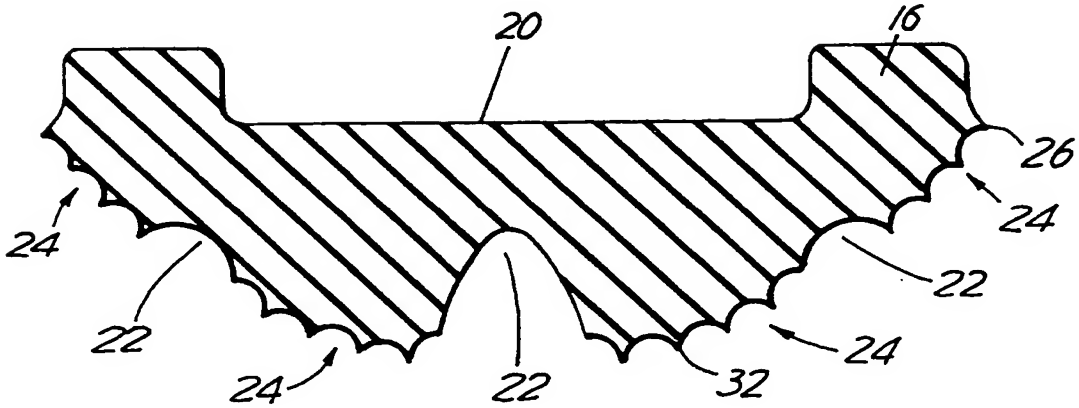

FIG.6

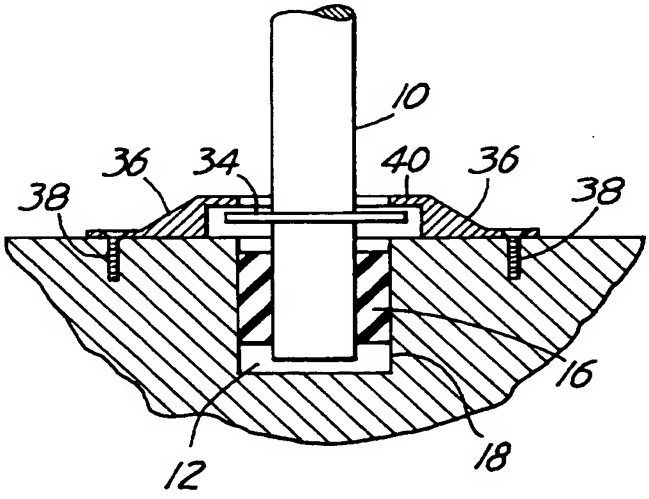

FIG.7

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EUROPEAN SEARCH REPORT

Application Number

EP 93 30 3043

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DE-A-2 924 432 (H. TISCHHAUSER)	1-3,6,7, 11	E01F15/00 E01F9/01
Y	* page 5, paragraph 3; figures *	4,8	
X	CH-A-535 331 (R. WARTHMANN) * the whole document *	1-3,6,11	
X	US-A-3 385 565 (F. CUTHBERT) * column 2, line 33 - line 45; figures *	1-3,6,11	
Y	DE-U-8 713 562 (N.Y. HAMBURGER GUMMI-WAREN)	4,8	
A	* the whole document *	11	
A	CH-A-618 488 (I.P. HUDEC)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E01F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	12 AUGUST 1993	VERVEER D.

CATEGORY OF CITED DOCUMENTS

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